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PATENT APPLICATION
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AUTOMATIC REMOTE FIRMWARE UPGRADE

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AUTOMATIC REMOTE FIRMWARE UPGRADE

FIELD OF THE INVENTION

The present invention relates to firmware associated with imaging systems. More specifically, the present invention relates to upgrading firmware from sources external to the imaging system.

BACKGROUND OF THE INVENTION

5 Imaging systems such as printers, fax machines, and copiers are virtually omnipresent, and can be found in homes and offices worldwide. The development of such systems has facilitated improvements in communication that have in turn fostered an enormous change in the way people live and work. Telecommuting, paperless offices, and intra-office networks represent but a few
10 examples of the advancements that have been made possible by modern imaging systems.

Some imaging systems, such as the HP LASERJET 8100 by Hewlett-Packard Company, use firmware as part of their operating systems. Firmware gets its name from having characteristics of both hardware and
15 software, and is typically provided as permanent instructions embedded within ROM (read-only memory) chips, such as PROM - Programmable ROM and EPROM - Erasable Programmable ROM.

Over the "life" of an imaging system, it is advantageous to upgrade the system firmware to enhance the functionality of the imaging
20 system. It is known to upgrade firmware using a feature referred to as Remote Firmware Upgrade (RFU), by which upgrades are acquired from sources external to the imaging system, such as web sites or dial-up databases. Known RFU features assume a "push" model requiring proactive participation of the imaging system user. The user can employ a PC to obtain an RFU downloadable image
25 from the imaging system manufacturer's web site, then install the file in the imaging system firmware.

This approach presents a number of difficulties. For example, the push approach is not user-friendly. System users are unlikely to consider imaging system firmware upgrades to be a high priority, resulting in infrequent upgrades if they are remembered at all. The time involved in obtaining and installing an upgrade is considerable, ranging from 15 to 30 minutes. New users are apt to make mistakes in downloading and installing the upgrade. Furthermore, obtaining and storing the RFU downloadable image can create computer problems. The size of the RFU downloadable image can be up to 8 MB which, if left undeleted by the user, takes up valuable disk space. Also, using a PC to first obtain and then install the RFU downloadable image results in redundant network traffic.

The complexity, inconvenience, and potential for error involved in known RFU features present a significant obstacle to making otherwise desirable changes. Consequently, this undeniably useful feature is not being used to its fullest potential in existing system configurations.

It can thus be seen that the need exists for RFU features that ameliorate the disadvantages of those used in known systems.

SUMMARY OF THE INVENTION

These and other objects are achieved by providing an imaging system including firmware. The imaging system includes a communications device adapted and constructed to facilitate communication between the imaging device and a remote source of information. An automatic remote firmware update mechanism is adapted to selectively and automatically retrieve firmware upgrade information from the remote source of information via the communications device. The automatic remote firmware update mechanism can also selectively and automatically install the firmware upgrade information into the firmware of the imaging system.

The automatic remote firmware update mechanism can form a part of firmware installed in the imaging system. The communications device can be provided as a modem adapted to connect to, and access information from, a

web site, or as a network interface card, such as an HP JetDirect card, which will connect a printer to a LAN.

The imaging system can also include a flag mechanism for storing a value corresponding to an update trigger parameter. A flag parameter update
5 mechanism can be provided to incrementally increase the update trigger parameter in response to a sensed condition. A trigger mechanism is adapted to actuate the automatic remote firmware update mechanism to automatically retrieve firmware upgrade information when the update trigger parameter reaches a predetermined update value. The sensed condition can be a condition
10 such as page count through the imaging system, or the passage of a predetermined amount of time. The imaging system is also adapted to periodically check the update trigger parameter, and to compare downloaded firmware upgrade information to existing firmware to determine the necessity of installing the downloaded firmware upgrade information.

15 The imaging system can include a mechanism for notifying a system user when firmware has been upgraded.

A method of updating firmware is also provided in conjunction with an imaging system including firmware, and a communications device adapted and constructed to facilitate communication between the imaging device and a
20 remote source of information. In a first step, firmware upgrade information is selectively and automatically retrieved from the remote source of information via the communications device. Next, the firmware upgrade information is selectively installed into the firmware of the imaging system.

The features of the invention believed to be patentable are set
25 forth with particularity in the appended claims. The invention itself, however, both as to organization and method of operation, together with further objects and advantages thereof, may be best understood by reference to the following description taken in conjunction with the accompanying drawings.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a schematic illustration of an imaging system in accordance with the principles of the present invention.

FIG. 2 is a flow chart illustrating the operation of an imaging system including a remote firmware update feature in accordance with the principles of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

An imaging system 10 in accordance with the principles of the present invention is shown in FIG. 1. The imaging system 10 can be provided, for example, as a printer, copier, or fax machine. The illustrative examples that follow are set in the context of a LASERJET printer manufactured by Hewlett-Packard Company. It will be understood, however, that the principles of the present invention are applicable to any suitable imaging system.

The imaging system 10 includes a control panel 12 which provides a user interface mechanism. The control panel 12 can be, for example, a keyboard or touchscreen as is known in the art. The control panel 12 is connected to imaging system firmware 14, which contains permanent instructions embedded within a ROM chip. The system 10 also includes a communications device 16, which may be provided as a modem or other communications interface. One example of such a device is a JET DIRECT card available from Hewlett-Packard Company.

In accordance with the present invention, the imaging system firmware 14 includes a Remote Firmware Upgrade (RFU) feature 18. The RFU feature 18 is composed of a set of programming instructions, residing in the firmware 14, that allow the RFU feature 18, in conjunction with the operating system of the imaging system 10 and a remote source of information or external data source 20 (external to the imaging system firmware), to automatically obtain firmware upgrades at pre-set intervals.

Those of skill in the art will recognize that the specific programming used to achieve the results described herein will become apparent upon appreciation of the operational flow chart set forth in FIG. 2. The remote firmware upgrade process begins at point 22, wherein the imaging system is configured. The imaging system firmware can configure an update value which, when met, acts as a point at which the system should update itself in response to a sensed condition, such as page count or the passage of time. The configuration can be a factory pre-set. Alternatively, the system user can configure the system using the control panel, a PML object, or a PjL variable. It is contemplated that, although the need for updates will vary in different situations, reasonable restrictions should be placed on the update value so that the web site or other information source is not overwhelmed, yet users still get reasonably frequent upgrades.

After the imaging system is actuated at point 24, the firmware checks the update trigger parameter at point 26. As the system operates, a flag parameter update mechanism incrementally increases the update trigger parameter in response to a sensed condition, as described above. At point 28, a flag mechanism is invoked. The flag mechanism compares the update trigger parameter to the update value from the system configuration. If the update trigger parameter does not meet the update value, system status returns to point 24. If the update trigger parameter meets the update value, a trigger mechanism is adapted to actuate the automatic remote firmware update mechanism to automatically connect to the outside source of information at point 30. At point 32, the automatic remote firmware update mechanism retrieves firmware upgrade information. If the information source is a web site, retrieval includes establishing a connection with the web site, then downloading the image file.

The downloaded information is compared to existing firmware at point 34, in order to determine whether or not the upgrade is needed. If the existing firmware is the latest version, the update flag is re-set at point 38, and system status returns to point 24.

It may be desirable to notify the user or system administrator at point 46 that the upgrade has been completed. Alternatively, a notice requesting user permission to install the upgrade could be generated between points 36 and 40.

Although the present invention has been described with reference
15 to specific embodiments, those of skill in the art will recognize that changes
may be made thereto without departing from the scope and spirit of the
invention as defined by the appended claims.